

Appl. No. : 10/678,766
Filed : October 2, 2003

REMARKS

Claims 1-33 are pending in the present application and stand rejected under 35 U.S.C. §103(a) as being unpatentable over George (J. Phys. Chem. 100:13121-13131 (1996)) either alone or in combination with one or more secondary references. In particular, the Examiner found that George discloses atomic layer deposition of a variety of oxides such as Al₂O₃, SnO₂, TiO₂, ZrO₂, In₂O₃, and HfO₂. The Examiner also found that George discloses that “the surface functional groups provide the technical means to alternate between various materials with atomic layer control and form superlattices.” While George does not teach purging the reaction chamber with an inert gas between pulses, as recited in independent Claims 1, 22 and 24, this deficiency was found to be made up for by Suntola (6,015,590).

First, Claim 1 recites an ALD process for producing a thin multicomponent oxide film comprising silicon, a transition metal and oxygen. There is no teaching or suggestion in George of such a multicomponent oxide film. Further, Claim 1 recites contacting a substrate with a vapor phase silicon compound and a vapor phase metal compound and converting the bonded silicon and metal compounds into an oxide by contacting them with a reactive vapor phase oxygen source. There is absolutely no teaching or suggestion of such a method in George. These deficiencies are not made up for by Suntola.

George is entirely concerned with understanding the binary reactions used to deposit single oxide films. Thus, there is no teaching in George of the deposition of multicomponent oxide films comprising silicon, a transition metal and oxygen, much less a method of forming such a film. The fact that George indicates that various types of simple oxide films can be deposited by ALD, or even that it is possible to alternate deposition of films of various types, does not provide any teaching or suggestion of a method of depositing a multicomponent film of any particular type, much less a specific method of depositing a multicomponent thin film comprising silicon, a transition metal and oxygen.

Applicants respectfully submit that in the absence of any teaching or suggestion in George to deposit a thin multicomponent oxide film comprising silicon, a transition metal and oxygen, the asserted prior art does not establish a *prima facie* case of obviousness. As a result the rejection of Claim 1 should be withdrawn. Further, as Claims 2-21 depend from Claim 1 and

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contain all the limitations thereof in addition to further distinguishing features, the rejection of these dependent claims should be withdrawn as well.

Similarly, with respect to Claim 22, there is no teaching in George of the deposition of a multicomponent oxide film comprising silicon oxide and a metal oxide, much less a method of producing such a film as recited in Claim 22. The generic statement in George that surface functional groups provide the technical means to alternate between materials to form superlattices does not provide any teaching or suggestion to pick silicon oxide and another metal oxide for use a multicomponent film. Thus, Applicants submit that the rejection of Claim 22 and 23, which depends therefrom, should be withdrawn.

Finally, Claim 24 recites a method of manufacturing a gate dielectric thin film by forming a tertiary oxide. George has no teaching or suggestion of forming a tertiary oxide by ALD. In this regard, Applicants note that a superlattice or nanolaminate structure comprising alternating binary oxides is not a tertiary oxide. Thus, the suggestion in George that it may be possible to form superlattices by ALD does not provide any teaching or suggestion of a method of forming a tertiary oxide comprising silicon and a metal as claimed. Thus, Applicants submit that Claim 24 should be allowed along with Claims 25-33, which depend therefrom.

CONCLUSION

Applicants respectfully submit that the present application is in condition for allowance. If any issues remain the Examiner is invited to contact the Applicants' representative at the number provided below in order to resolve such issues promptly.

Respectfully submitted,

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